



Vulnerability and Resilience in Flagstaff

September 28, 2021

Project Goals

1. Expand on adaptation methods outlined in the Carbon Neutrality Plan.
2. Consolidate information provided in relevant City documents.
3. Facilitate conversations with the Flagstaff community and obtain their feedback.
4. Provide recommendations to the City in a Resilience Resource Document.

Flagstaff Climate Documents

- 2012 – Resilience and Preparedness Study
- 2018 – City of Flagstaff Climate Profile
- 2018 – Flagstaff Vulnerability Assessment
- 2018 – Climate Action & Adaptation Plan
- 2020 – Council Declares Climate Emergency
- 2021 – Carbon Neutrality Plan

Definitions

Resilience:

- A community's ability to thrive when change occurs
- Involves anticipation and preparation for changing conditions

Vulnerability:

- The potential to be harmed

Adaptation:

- Actions that increase the ability to withstand, respond, or cope with climate change impacts

CLIMATE CHANGE IN FLAGSTAFF

Compared to
today, by 2050
we expect to
have, on
average...



- **Hotter** temperatures.
- Increased **risk of disease or illness** from **mosquitoes** and other pests.



- **Less snowpack.**
- Precipitation shifts from snowfall to rainfall



- Increased **high-severity wildfire risk.**
- Increased **damage from forest pests** due to drought-stressed trees.



- More severe **drought** conditions as temperatures rise.
- **Lower water quality** of reservoirs.

*Acquired from Flagstaff Vulnerability Assessment

Vulnerabilities: What is at risk?

Tourism & Economy



Water



Land Use & Housing



Health



Climate change poses risks to everything from our **health** and **infrastructure** to local **ecosystems**.

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Vulnerabilities: Tourism & Recreation

WINTER TOURISM

**HIGH
VULNERABILITY**



Significant **snowpack loss** will decrease winter recreation and tourism.

SUMMER TOURISM

**LOW-MEDIUM
VULNERABILITY**



More **wildfire, drought, or extreme heat** may temporarily reduce visitation in summer, spring, and fall.

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Vulnerabilities: Water Supply, Quality, & Infrastructure

AVAILABILITY

**HIGH
VULNERABILITY**



Reduced water availability and increased demand could cause water shortfalls.

QUALITY

**MEDIUM-HIGH
VULNERABILITY**



More **wildfire, drought, and flooding** are likely to impair water quality.

INFRASTRUCTURE

**HIGH
VULNERABILITY**



More **wildfire and flooding** are likely to significantly damage natural and human-made water infrastructure.⁸

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Vulnerabilities: Water Supply, Quality, & Infrastructure



Example of severe flooding due to extreme rainfall event.

(2021 Steve's Boulevard, CNN.com)

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Vulnerabilities: Forest Health & Wildlife

FOREST HEALTH

**VERY HIGH
VULNERABILITY**



Overall **declines in forest health and widespread forest loss** due to wildfires, drought, pests, and invasive species.

WILDFIRE

**HIGH
VULNERABILITY**



Larger, more frequent stand-replacing **wildfires**.

FLOODING

**MEDIUM-HIGH
VULNERABILITY**



Larger, more frequent **flooding** after wildfires. More floods in general.

INSECTS & PESTS

**HIGH
VULNERABILITY**



More **beetle infestations and invasive species** due to warmer, drier conditions.

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Vulnerabilities: Forest Health & Wildlife



Museum Fire of
2019

(ktar.com)

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Vulnerabilities: Land Use, Infrastructure, & Housing

OPEN SPACE

MEDIUM-HIGH
VULNERABILITY



Wildfires and hotter, drier conditions may make healthy open space more difficult to sustain.

LAND USE

LOW-MEDIUM
VULNERABILITY



Greater **population density** is planned away from wildfire- and flood-prone areas, with more city parks and open space to provide shade.

INFRASTRUCTURE

MEDIUM
VULNERABILITY



Hotter temperatures may stress buildings, utilities, and roads.

RESIDENTIAL ENERGY USE

MEDIUM
VULNERABILITY



Hotter temperatures may increase energy costs and make summer cooling out of reach for many households.

CLIMATE CHANGE IN FLAGSTAFF

Vulnerabilities: Public Health, Safety, & Services

AIR QUALITY

MEDIUM
VULNERABILITY



More periods of **poor air quality** due to larger, more frequent wildfires.

HEAT-RELATED ILLNESSES

MEDIUM
VULNERABILITY



More extreme heat days (>90°F) could increase the risk of **heat-related**

ALLERGEN EXPOSURE

LOW
VULNERABILITY



Increased **exposure to allergens** is possible as spring grows warmer and more dry weather increases dust.

MENTAL HEALTH

LOW-MEDIUM
VULNERABILITY



More frequent extreme events could increase the **risk of mental health issues.**

INFECTIOUS DISEASES

LOW-MEDIUM
VULNERABILITY



Increased **exposure to valley fever and West Nile virus** is possible as the warm season lengthens. Existing response resources may be adequate.

Tying It All Together

Flagstaff's Carbon Neutrality Plan Goal #2:
Prepare the City's communities, systems,
and resources to be more resilient to
climate change impacts.

Plan of Action: Furthering Flagstaff's discussion on adaptation and resilience, through conversations with the community and City Council

- Present to the Sustainability Commission
Thu 9/23
- Present to City Council
Tue 9/28
- Present to Commission on Diversity Awareness
Tue 10/19
- Present to Commission on Inclusion and Adaptive Living
Tue 10/26
- Open Forum
(community feedback)
Oct (TBD)
- Final Presentation to City Council
Tue 11/30

Thank you.
We welcome
your feedback.

Contact us:

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